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An empirical analysis of resources in the Indian pharmaceutical industry

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Abstract

Purpose – The purpose of this study is to utilize the concept of resource based approach to ascertain the resources and the interactions that exist among these resources leading to differential performance in the Indian pharmaceutical industry. Based on review of the literature, the study also highlights differences among companies operating in economically developed economies and in an emerging economy in the pharmaceutical industry, in terms of resources that matter.

Design/methodology/approach – Panel data ranging from 2005-2010 comprising of the listed companies from the Indian pharmaceutical industry is analyzed using random effects regression technique.

Findings – The analysis reveals company age and the interaction of R&D expenditure with MD experience are significantly related to performance. Further, the analysis reveals a negative relationship of R&D expenditure with performance in two out of the four models and marketing expenditure is found to have no significant impact on performance.

Practical implications – The paper helps managers understand the resources they should build upon to improve performance.

Originality/value – The paper adds to existing literature on the resource based research in India, where the application of the concept is less prevalent.

Keywords Resource based approach, Resources, Interaction, Pharmaceutical industry, Performance, India

Paper type Research paper

1. Introduction

According to the resource based approach (RBA) a firm comprises of resources, that include all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that improves its efficiency and effectiveness (Barney, 1986, 1991; Amit and Schoemaker, 1993; Collis and Montgomery, 1995). This approach helps a firm identify the kind of resources it should possess and develop so as to perform better than its peers. It provides answer to the question that lies at the core of strategic management research "What leads a firm to superior performance?" RBA assumes that the resources are heterogeneously distributed across firms. A firm possessing resources with characteristics of being valuable, rare and inimitable has an advantage over its competitors (Barney, 1991).

Researchers in the field have been trying to identify "the" resources. Identification will help the managers differentiate the valuable from the non-valuable (Peteraf, 1993). The valuable ones will thus get the attention they deserve as the firm protects them from being imitated, bid away to the competitors or rendered valueless as a substitution by other assets (Dierickx and Cool, 1989). Also, resources identified, using the resource

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based logic, provide an incentive and justification to the managers to obtain and exploit them (Newbert, 2007). Further, a firm which has identified the key resources will know whether the present bundle of resources is enough, else the resources should be acquired or developed to have an advantage (Barney, 2011). Thus, the importance of the resources that gets highlighted helps the manager see that despite difficulty they should consider leveraging those resources further (Peteraf, 1993).

The resources, for better understanding, are often classified into two categories, namely resources and capabilities (Amit and Schoemaker, 1993; Barney and Clark, 2007). Resources are the stocks of assets owned and controlled by the firm while capabilities are those constituents of the firm which help exploit the resources in implementation of the firm's strategies (Teece *et al.*, 1997). Together, with the identification of resources, the researchers in the recent past have also found the existence of interactions among resources and capabilities (Schroeder *et al.*, 2002; Nerkar and Roberts, 2004). Hughes and Morgan (2008) assert that resources and capabilities form a unique configuration when they interact among themselves and with each other and this configuration leads a firm to differential performance.

Past research has found that the resources and capabilities that lead to superior performance vary with the industrial context (Amit and Schoemaker, 1993). In other words, the resources and capabilities which are strategic in one industry may not be so in another. In the present research, the Indian pharmaceutical industry forms the scope of the study. The application of resource based logic to the pharmaceutical industry has been seen in the western context. The resources have been identified in the US pharmaceutical industry that lead to superior performance (Henderson and Cockburn, 1994; Yeoh and Roth, 1999; De Carolis, 2003). The pharmaceutical industry forms a fertile ground for application of RBA as the advantage secured is tied to the knowledge and technology development (Yeoh and Roth, 1999). With increased investment in the knowledge based assets, signified by the increased proportion of R&D as a proportion of sales, the Indian pharmaceutical sector is ideal for the study of RBA.

The application of RBA in the Indian context, particularly in the pharmaceutical industry has been sparse. Identifying valuable resources in the pharmaceutical industry, Majumdar (1994) studies the areas of operations in which the resources namely fixed capital, working capital and human resources are utilized better. Further, Chittoor *et al.* (2009) probe the role of international technologies and financial resources in product market internationalization and the effect this product market internationalization has on performance. However, research identifying the resources strategic in the Indian pharmaceutical industry is not found. Such an evaluation would help the managers in developing the right resources contributing to better performance. Also, it is important to understand the differences in terms of resources that matter in the pharmaceutical industry that exist in the economically developed countries and an economically emerging country, like India. Lately, the Indian pharmaceutical corporations has become target for acquisitions by the multinational pharmaceutical companies (Ranbaxy laboratories was taken over by Japan based Daiichi Sankyo, US based Abbott Laboratories took over Piramal healthcare, Paras Pharmaceuticals was acquired by UK based Reckitt Benckiser). It is important to understand whether the multinationals can replicate their business model in India or some modifications are required in their strategies. Thus, forming our research questions:

RQ1. To identify the resources that lead to better performance in the Indian pharmaceutical sector.

RQ2. To identify the interactions among the resources that lead to superior performance.

The plan of our study is, we first discuss in brief the Indian pharmaceutical industry, then we build on the theory and the hypothesis followed by the analysis and interpretation and finally ending with the conclusion.

2. Indian pharmaceutical industry

The Indian Patent Act of 1970 had an enormous impact on the Indian pharmaceutical industry. It expressly excluded patents for products and only the processes required patents. The Act brought in laxity in regulations leading to the growth of the Indian pharmaceutical industry. A number of players entered the industry, which was earlier limited to a few due to stricter norms. Reverse engineering was resorted to, which meant that the firms just copied what the patent stated. Indian firms waited for the product to be launched by a multi-national corporation (MNC) and analyzed its molecular structure studying the copy of the patent. They brought in the same drug with a slightly different process at a margin of cost than the MNC (Fernberg and Majumdar, 2001). Hence, research and development (R&D) expenditure was not much required. It was not until the Indian Government signed the agreement of Trade Related Intellectual Property Rights (TRIPS) in 1995 which required India to amend its patent laws to allow for pharmaceutical product patents by 2005, that the Indian players started concentrating on R&D.

In the period of mid-1990s many companies delved into the field of generics. Generics are drugs whose patent protection has expired. The patent lasts for a specified period usually 17 years after which it expires and the drug becomes a generic. The R&D team of a company finds processes that do not infringe on any of the originator company's process patents, which is characterized as the generic. The Indian players successfully marched into the field of generics by assimilating and creatively improving their reverse engineering R&D capabilities (Chittoor *et al.*, 2009). The foray into generics actually transformed the whole picture of the Indian pharmaceutical industry. Due to this, today, India tops the world in exporting generic medicines. India's pharmaceutical industry is now the third largest in the world in terms of volume and stands 14 in terms of value as per the 2009 figures (CCI Report, 2011)[1]. Today, Indian generic players compete with the generic firms of the advanced countries like the USA and also with the ones based in China, Italy and Israel (Mueller, 2006). India exports generic drugs to Commonwealth of Independent States (CIS) countries, Africa, and even highly regulated market in the USA and European countries (Kale, 2007). This indigenous, self reliant development characterizes the Indian pharmaceutical industry today. Indian firms have accumulated extensive knowledge in process R&D (synthetic and organic chemistry) but are characterized by severe weakness in other scientific disciplines like medicinal chemistry and biology. This indigenization rather than innovation made R&D in Indian pharmaceutical firms more insular, with a knowledge base firmly rooted in imitative reverse engineering process R&D (Kale, 2007).

Simultaneously, the Indian pharmaceutical sector was growing increasingly competitive. Pharmaceutical MNCs were being subject to low or negative growth,

stricter regulatory environment, and increasing levels of patent litigation in their home markets (Edwards, 2010). In contrast, the changes in the patent regime in the Indian pharmaceutical sector coupled with increased personal spending fueled by economic growth and greater access to medical care (Garg *et al.*, 1996) India seemed a prolific opportunity. Thus, the focus of the MNCs on the Indian market increased. For the domestic players survival alongside the mighty MNCs meant to compete and competing meant investment in knowledge assets. The industry saw an increase in R&D expenditure as a proportion of sales. The larger domestic players in the industry acknowledged the advantage a new blockbuster drug can give them. Thus, realizing the importance of being innovative, the firms got the best scientists, building the best labs with the state of art technology, entering into the high risk, high reward field of new drug discovery research, and, investing revenue generated from generics business into innovative R&D (Kale and Little, 2007).

Thus, the industry grew from the reverse engineering phase to the generics phase and into the new chemical entity phase. But, it still has a long way to go as compared to the developed countries in terms of innovation characterized by new drug development. The diversion of interest towards new products is a relatively new phenomenon where none of the firms have been successful in coming with new products. Generics is where the revenue lies and where the Indian players are the strongest. Hence, it is interesting to identify the drivers of the Indian pharmaceutical industry, especially post-2005, i.e. when the international patent law became operational in India. To address this we try to find the resources that led the firms to differential performance in the post 2005 period.

3. Theory building and hypotheses

A number of studies building upon the concepts of RBA identify the strategic resources in diverse industries. Human capital (Hatch and Dyer, 2004), technical engineering experience, knowledge of and capability to serve the needs of customers (Collis, 1991), information technology (Bharadwaj, 2000) internal and external learning (Schroeder *et al.*, 2002), brand name reputation (Combs and Ketchen, 1999), management quality and depth, technology expertise, adequacy of capital base (Mehra, 1996), tangible and intangible sales and distribution resources (Gruber *et al.*, 2010), service climate and managerial information technology knowledge (Ray *et al.*, 2004) are some of the resources that have been identified over the years in the RBA research. Though there have been a range of resources identified as strategic, these have always been industry specific. Research in the pharmaceutical industry has seen R&D and marketing expenditure as resources that yield better performance (Henderson and Cockburn, 1994; Yeoh and Roth, 1999; De Carolis, 2003). It remains to be seen whether the same holds true in case of emerging economy like India. Tacit knowledge constitutes a valuable intangible resource (Collis, 1994). Greater experience leads a firm to build more resources (Nerkar and Roberts, 2004) which may result in better performance. The present study also tries to explore tacit knowledge in the form of company age as a strategic resource. Capabilities help a firm exploit its resources (Winter, 2003) helping a firm in identification, development and efficient deployment of resources (Teece *et al.*, 1997). Also, managerial ability is seen as a capability providing heterogeneity to a firm. The past decisions by managers are the basic genetics which the firms possess (Helafat and Peteraf, 2003). Managerial ability is thus, of immense consequence to a firm. The present research tries to establish whether managerial ability helps firm attain

superior performance. In the discussion that follows we try and review the past research in the field of RBA and build the hypothesis in the context of our study, that is, the Indian pharmaceutical industry.

3.1 R&D and performance

For a firm to grow in the long run, it is important that it innovates both in terms of process as well as product (Acquaah and Chi, 2007). A knowledge intensive industry coming up with new products would require significant strategic commitment to R&D. Firms that invest heavily in R&D are more likely trying to compete on the basis of innovativeness and technology breakthrough (Lin *et al.*, 2006) although high investment does not guarantee generation of successful innovation. High levels of innovativeness help a firm in exploiting new possibilities (Cho and Pucik, 2005), in creating barriers to entry and entering new product lines (Jose *et al.*, 1986). Expenditure on R&D has been used in many industries (Scherer, 1980) as a measure of innovativeness, and is seen to be strategic in a number of industries. Kor and Mahoney (2005) in trying to establish strategic resources in the medical, surgical and dental instruments industry; and Lin *et al.* (2006) in the US technology based firms find R&D having a significant impact on performance. De Carolis and Deeds (1999) while studying the biotechnology industry find R&D not giving consistent results across the models as a predictor of firm's performance. Hirschey (1985) in his research observes market value being closely related to the level of expenditure on R&D. In carrying out research in multiple industries Villalonga (2004) ascertains R&D to be a valuable intangible asset in mining and construction, food, textiles and chemicals, manufacturing, transportation and services. In the pharmaceutical industry, Yeoh and Roth (1999) find R&D expenditure as a significant resource. Thus, bringing on to our first hypothesis:

H1. Increasing levels of R&D expenditure leads to superior performance.

3.2 Marketing and performance

Morgan *et al.* (2009) find that marketing capabilities do lead to superior performance. Marketing as a resource has been considered in itself to have huge potential in making a difference to the firm's performance. In the bio-technology industry, marketing expenditure is seen to be contributing to the financial performance of the business (De Carolis, 2003). On the other hand, Lin *et al.* (2006) find increase in advertising and marketing expenditure as an indicator of higher customer orientation and market knowledge. In the US joint ventures, Song *et al.* (2005) find marketing as a significant resource in achieving higher performance. Vorhies *et al.* (2009) while studying the US motor industry and Kor and Mahoney (2005) while studying medical, surgical and dental instrument industry identify marketing as a strategic resource in their respective industrial contexts. Yeoh and Roth (1999) confer that in the pharmaceutical industry promotional activities play a significant role in selling to physicians, retailers and hospitals. In their research paper they find sales force expenditures having significant impact on company performance. Thus, marketing expenditure seems to have a significant role to play in a firm's differential performance:

H2. Increasing levels of marketing expenditure leads to superior performance.

3.3 Company age and performance

As a firm grows, with age, it develops a network of relationships with various institutional actors like government, suppliers, customers, banks and other institutions (Makhija, 2003). Over the years it gathers knowledge, learning the do's and the do not's, the rights and the wrongs, what will tick and what will not in its sphere of business. This gathered knowledge is tacit, i.e. which cannot be codified, thus lending uniqueness to a firm delivering superior performance (Berman *et al.*, 2002). Physical assets may lead a firm to higher performance but it is the organizational resources developed over the years through a company's unique historicity and social complexity that lead a company to advantage over its competitors (Makhija, 2003). In the Indian pharmaceutical industry, it can be seen that though Indian firms started off with reverse engineering as a strategy to compete, carrying it out they built several capabilities, carving out specific markets for themselves, networks, contacts, resources which lend them advantage over the new players in the industry (Kale and Little, 2007). While endorsing this view-point Berman *et al.* (2002) state that the stock of tacit knowledge builds over time as the individual learns a particular skill or as member of a group or as a team learns to interact with each other. Thus, as the company ages, the interactions build, networks build, resources build and relationships build. This forms our third hypothesis:

H3. Increasing age of the company leads to superior performance.

3.4 MD experience and performance

Managerial ability is a source of resource value creation, which means efficient production with heterogeneous resources is a result of not having better resources but in knowing more accurately the relative productive performances of these resources (Holcomb *et al.*, 2009). Managerial ability is thus a capability that Teece *et al.* (1997) consider as the one that is required to deploy the rest of the resources. Dynamic managerial capabilities build, integrate and reconfigure organizational resources and competencies (Sirmon and Hitt, 2009). Acquaah and Chi (2007) find corporate management capabilities enhancing firm-specific profitability in the America's most admired companies as per the Fortune listing. In the Indian context, Cappelli *et al.* (2010) draw huge contrast with the West, and in their study they find that unlike their western counterparts who leave strategy development to profit heads, the Indian leaders own the strategy function, set the agenda and take a visible role in shaping the strategies that the managers bring to them. Their research makes it clear that in India it is the managing director (MD) of the company who guides the direction of the firm as here strategy and "guiding teaching" are complimentary priorities. Thus, the MD ability needs to be studied when establishing the role of managerial ability in the creation of advantage for the firm in India. An MD with more years of experience in the industry must have gained the knowledge about acquisition of resources and also about deployment of resources. His tacit knowledge would help the firm as he can better interpret the changes occurring in the organization's environment and the resources to be deployed to exploit the opportunity to the maximum.

Thus, the capability in the form of MD's knowledge and business acumen, operationalized through the amount of experience in the pharmaceutical industry, positively impact the company's performance, which forms the fourth hypothesis:

H4. Increasing MD experience leads to superior performance.

3.5 Interactions and performance

Recent research in RBA has seen a number of researchers trying to figure out the complementarities that exist amongst resources. The configurations themselves become a resource that help the owners do better than their counterparts. Cho and Pucik (2005) find that the companies possess certain resources which vary from being poor to mediocre and to good, but when they interact they complement each other so as to become a formidable force. Configurations are hard to copy as the other firms cannot straightway figure these out, thus giving the firm an advantage which it can sustain.

Sirmon and Hitt (2009) assert that decisions relating to the amount to be invested in a resource, as well as, relating to deployment of the resources play an important role in determining the direction of the company and therefore its performance. In India, both these decisions are taken largely by the MD of the company, thus his expertise interacts with the available resources thereby leading to unique configurations. The resources in question here are R&D expenditure and marketing expenditure. Thus, the tacit knowledge of the MD regarding the resources of the organization, i.e. the R&D and marketing resources which he has gathered over the years becomes a strategic resource. By means of his experience the MD can decide as to which R&D and marketing avenues to explore and how much to spend. This means R&D and marketing expenditure alone cannot yield revenue unless there is a mind guiding these resources. Carmelli and Tishler (2004) find support for intangible resources like managerial capabilities interacting with other resources. Kor and Mahoney (2005) find support for the interaction between managerial ability and R&D intensity, thus, leading to our final hypothesis:

H5a. MD experience interacts with R&D expenditure to yield superior performance.

H5b. MD experience interacts with marketing expenditure to yield superior performance.

4. Database and sample

The Indian pharmaceutical industry, which forms the scope of our study, is taken to comprise of all the companies listed as pharmaceutical companies on the Bombay Stock Exchange (BSE) as on 31 March 2010. The companies that actually formed the list are those for which the data was available for the variables under study for each of the year of study, i.e. from 2005 to 2010. We chose this time period because in 2005 the TRIPS agreement became operational, thus, bringing the Indian companies under the international patent law and thus forcing them to give up on their previous reverse engineering mode of operation. Thus, this period gives us better grounds to use the RBV as our base because it requires the existence of intellectual resources which can exist largely in such an environment. Our screening of the firms brought us to a sample of 51 firms for which data for all the variables under study and for each of the six years was available. The data was collected from the annual reports of these companies and from the Centre for Monitoring Indian Economy's database Prowess.

4.1 Variables

4.1.1 Dependent variable

Firm performance. Tobin's Q has been used as a measure for firm performance which reflects the market expectations of the firm's future growth and profit potential

(Lindenberg and Ross, 1981; Montgomery and Wernerfelt, 1988). It is a stock market based measure. It is calculated as a ratio of a firm's market value to the replacement cost of its assets (Acquaah and Chi, 2007). We use Tobin's Q since it overcomes the limitations of accounting based measures along with a strong empirical and theoretical base (Bharadwaj *et al.*, 1999). Tobin's Q has been calculated as:

$$\text{Tobin's Q} = \frac{\text{MVE} + \text{PS} + \text{Debt}}{\text{Total Assets}}$$

where the market value of equity (MVE) is the firm's share price multiplied by the number of shares outstanding. preference share (PS) is the liquidating value of the firm's preferred share capital. Debt is the value of the firm's short-term liabilities net of its short-term assets plus the book value of its long-term debt. TA is the book value of the firm's total assets at time t.

4.1.2 Independent variables

R&D expenditure. The R&D expenditure of the firm was extracted from the annual reports specifically from the statements containing particulars pursuant to the companies disclosure of particulars in the report of board of directors rules, 1988 forming part of the report of the directors.

Marketing expenditure. The variable marketing expenditure comprises of both marketing and advertising expenditure disclosed in the profit and loss account in the annual reports of the company.

Company age. Company age is the number of years since the incorporation of the company as disclosed in the Prowess database.

MD experience. MD experience comprises the total experience of the MD in the pharmaceutical industry. This information was collected from the information which is supposed to be disclosed under section 217(2A) of the Indian Companies Act, 1956 in the annual reports. Some of the companies which did not disclose the information under section 217(2A), however, either gave information elsewhere in the annual report or on their official web sites.

4.1.3 Control variables. Total sales is used as a measure of firm size to control the influence of size on market value. De Carolis (2003) states that size of the firm can have confounding impact on performance of the firm.

MD age is used as a measure to control for the influence of age on the experience of MD. As experience is related to age its effect thus needs to be controlled.

5. Analysis and results

Descriptive statistics associated with the data are disclosed in Table I. The correlation matrix does portray a likely problem of multi-collinearity. To address this, variable inflation factors (VIFs) were computed. A score below ten is considered to rule out any possibility of multi-collinearity (Berman, 2002). The score for each of the variables was found to be less than ten, the average VIF was 5.04. VIFs were calculated as carried out by Hitt *et al.* (2006), using the OLS model as random effects (RE) regression does not support the calculation of VIFs.

The descriptive statistics reveal that, on an average, R&D expenditure is Rs.56.41 crores and marketing expenditure is Rs. 46.06 crores. The mean of company age is 32.92 years, while that of MD experience is 27.77 years.

Variables	Mean	SD	1	2	3	4	5	6	7
Tobin's Q	1.78	2.89	1						
R&D expenditure	58.77	155.08	0.01	1					
Marketing expenditure	53.69	89.34	0.04	0.49*	1				
Company age	33.52	18.78	19*	−0.01	0.09	1			
MD experience	28.43	9.4	−0.03	−0.13**	−0.06	0.26*	1		
Sales	901.23	1,256.6	0.08	0.52*	0.68*	0.22*	0.01	1	
MD age	54.09	9.79	−0.06	−0.16*	−0.10*	0.25*	0.84*	−0.07	1

Table I.
Descriptive statistics and correlations

Notes: Significant at: $^{*}p < 0.01$ and $^{**}p < 0.05$; $n = 256$ for all variables; R&D expenditure, marketing expenditure and sales are in rupees crores; company age, MD experience and MD age are in years; 1 crore = 10 million

We calculated the Durbin-Watson Statistic to know whether the problem of auto correlation exists or not. The value of Durbin-Watson statistic ranges from 0 to 4. If the statistic is close to 4 the data has negative correlation, if it is close to 0 the data has positive correlation, while a score near 2 reveals no auto correlation. For the data in question the score was 2.06, which is close to 2 meaning thereby that no auto correlation exists.

In addressing the issue relating to the application of fixed effects (FE) or RE we resort to the Hausman test. The Hausman test, ascertains the appropriateness whether RE or FE regression is to be used. The null hypothesis (H_0) states that the regressors are uncorrelated with the individual level effects and the alternate hypothesis being the regressors are correlated with individual level effects. Acceptance of H_0 means RE would be appropriate, while rejection of H_0 means FE would be appropriate (Baum, 2006). For the study, the application of Hausman test revealed the acceptance of H_0, thus RE is used for analysis.

Following Chittoor *et al.* (2009), as a conservative measure, we resort to heteroscedasticity-consistent White's robust standard errors for reporting p-values.

Table II gives the results of random effects regression model.

	Model I β coefficients	Model II β coefficients	Model III β coefficients	Model IV β coefficients
R&D expenditure	0.01	0.01	−0.32**	−0.34**
Marketing expenditure	−0.05	−0.12	−0.03	−0.009
Company age	0.24*	0.25*	0.24*	0.24*
MD experience	0.14	0.13	0.09	0.1
Sales	0.09	0.09	0.08	0.08
MD age	−0.23***	−0.24***	−0.26**	−0.26**
R&D expenditure × MD experience			0.34*	0.36**
Marketing expenditure × MD experience		0.08		−0.05
Intercept	−0.03	−0.03	−0.02	−0.025
Wald Chi	13.62*	14.17*	19.61*	19.53*
R^2	0.12	0.13	0.15	0.15

Table II.
Random effects GLS regression analysis of effects of resources and their interaction on Tobin's Q

Notes: Significant at: $^{*}p < 0.01$, $^{**}p < 0.05$ and $^{***}p < 0.10$; $n = 256$ for all variables

In Model I the resources have been introduced without considering the interactions. We find that company age is significant with a positive coefficient and the control variable MD age is significant at 0.10 level of significance.

In Model II, the first interaction between marketing and MD experience is introduced along with other variables. It is found that company age and MD age are the two significant variables while the others are not.

Model III comprises the introduction of second interaction between R&D and MD experience. In this model R&D is significant at 0.05 level of significance though it has a negative coefficient, company age is significant at 0.01 level of significance, the interaction between R&D expenditure and MD experience is also significant at 0.01 level. The control variable MD age is significant at 0.05 level.

Model IV is the total model where all the variables have been introduced. In this model all the variables significant in Model III remain significant, i.e. the R&D expenditure at 0.01 level with a negative coefficient, company age is significant at 0.05 level of significance followed by the interaction between R&D and MD experience and the MD age at 0.01 level of significance.

Analyzing, the proposed relationship between R&D and performance is found to be significant but inversely related in two out of the four models. *H3* finds support in all of the four models meaning thereby increased company age is related to improved company performance. The proposed relationship between R&D and MD experience interaction and performance is strongly supported. On the other hand, the proposed relationship between marketing expenditure, MD experience and performance, i.e. *H2* and *H4* do not find any support. *H5b*, i.e. MD experience interacts with marketing expenditure to yield superior performance also does not find support. Thus, *H1*, *H3* and *H5a* are accepted whereas *H2*, *H4* and *H5b* are rejected.

6. Interpretation

Our *RQ1* was to identify the resources that help attain superior performance in the Indian pharmaceutical sector. The results depict that R&D expenditure does not significantly impact performance. In two of the models it is significant but connotes inverse relationship. The reasons for this may be, first, some of the players in the Indian pharmaceutical industry have forayed into new drug development. These firms are still at the development phase of the new molecules. R&D expenditures have been incurred but these are yet to translate into new discoveries. It is only when the final output, i.e. new drugs come into the market and thereby the benefits of such discovery start accruing to the company revenues, would the expenditure be linked to performance. Until then it is actually a drain on the revenue. The new drug discovery field is a high risk high return field. To actually come up with a new drug requires a number of years of effort, coupled with a high probability of failure in each phase. So, the linkage between R&D expenditure may not have been found. Second, a number of pharmaceutical firms somewhere along the road of drug discovery lost their way while moving from *in vitro* (test tube) and *in vivo* (animal) experiments to phase I or phase II of clinical trials (tests on humans), failing and even abandoning some of the drugs (Bisserbe, 2010). This meant a setback and thus wastage of R&D resources, which might be one of the underlying reasons explaining the negative relationship between R&D expenditure and performance. Never the less, taking a long-term view, it does not mean that R&D is a non-strategic investment. Going by the international scenario

where new drug discoveries help a firm become a market leader, Indian scenario may not be much different. As for the time being, R&D may not be translating into superior performance but, it seems that it would lead to superior performance in the near future. Believing, this Glenmark Pharmaceuticals, an Indian pharmaceutical company continues to invest in R&D even though all the molecules it was developing with the top international pharmaceutical companies have failed. Third, most of the firms are still concentrating on generics. Generics require R&D expenditure as well, but not to the extent as in case of new product development. In the economically developed world, firms rely on blockbuster drugs to beat competition and new drug discovery research is order of the day. India has a long way to go in this sphere. As the Indian pharmaceutical industry is characterized by generics, it can be proposed that for R&D to be seen as a significant resource, one might have to wait for the firms to come out with new products. Further, when these new products generate revenues, probably then would one find a link between R&D and performance.

Marketing expenditure is not found to have a significant relationship with performance. Indian industry is a prescription based industry. Over the counter products do not occupy as important a position in the product portfolios of Indian firms, as is the case in the developed markets. Hence, the Indian pharmaceutical industry is characterized by low levels of marketing expenditures.

Company age, signifying the valuable tacit knowledge of a firm, is positively related to performance. The learning that a firm goes through in its life becomes an important resource. This resource cannot be imitated or substituted. Financial investments are not enough for a new entrant and even for the existing ones to match such knowledge. This is one of the reasons for pharmaceutical MNCs resorting to acquisitions. To achieve the same through organic growth would require a lot of time, meaning lost opportunities. Thus, a company seeking to deliver superior performance, especially a recent entrant, would have to seek out opportunities to profitably combine its units with the operations of the existing firms through mergers or acquisitions.

R&D expenditure interacts with MD experience to have a significant impact on performance. Since the MD takes all the major decisions in an organization in India (Cappelli *et al.*, 2010), his knowledge about the pharmaceutical business interacts with the firm's R&D, leading to a combination which leads to differential performance. We find support for our proposition that it is the managerial ability that is required to decide the magnitude of R&D and its rightful deployment, which leads to significant returns and not the resource *per se*. It is important that the R&D be properly managed to yield significant returns. The MD's acumen, knowledge and skill operationalized through his experience interact with the innovative capability measured through the R&D expenditure to yield a configuration of resources that result in superior performance for the firm. These resources, in isolation, are not seen to make significant contributions to the performance of the organization. It thus highlights the importance of the ability of an experienced MD coupled with a firm's innovative ability that helps a firm perform better.

7. Conclusions

The firms in the Indian pharmaceutical industry, in order to attain better performance would require gathering certain resources. The present study brings to light the resources that a firm needs to possess in order to achieve superior performance.

Tacit knowledge acquired by the existing firms over the years may become a huge barrier for the new entrants in the industry. The new entrant, to find its feet, may require to look for mergers, acquisitions or even joint ventures. Building tacit knowledge organically will mean loss of opportunities.

The presence of managerial skill, knowledge and acumen together with the right R&D expenditure helps a firm attain superior performance. The interaction among these produces a unique configuration which in itself becomes a resource required to attain better performance. The firm, in pursuit of better performance, will need a leader at the helm of affairs MD to exercise his experience in utilizing R&D expenditure.

Although the study has found R&D expenditure and marketing expenditure to not playing a role in the attainment of superior performance, but the firms cannot do away with them. The foray into new chemical entities may not have been very fruitful but the firms do realize that it is the new product that will help them meet the fiercely growing competition. With the percentage share of OTCs in the product portfolio of the firms in the pharmaceutical industry rising, marketing expenditure will become important for a firm looking for superior performance.

The study does concentrate on the pharmaceutical industry, but looking at the larger picture, it suggests that, as propounded by the builders of the RBA, any firm will require having with it certain resources that would help it attain better performance.

Note

1. www.cci.in/pdf/surveys_reports/indian-pharmaceuticals-industry.pdf

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